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AMERICAN WORK IN THE DEPARTMENT OF RECENT MOLLUSCA DURING THE YEAR 1879.

BY WILLIAM H. DALL.

IT has not been practicable for the writer to emulate the *Zoölogical Record* in minuteness of detail, however desirable that course might have been for some reasons. It is possible that some minor papers may have been overlooked from not having been sent to the Smithsonian Institution or the writer during the year, but it is not likely that anything of importance has escaped notice. It was open to the writer to make this article a mere catalogue or a review of work done. He has chosen the latter as the most useful course, and has freely expressed his opinions in regard to the papers enumerated. It is a subject for regret that, in America, among those who are interested in Mollusca especially, the veterans are passing away and few come to fill their places. This is perhaps due to the absence of any satisfactory text book, the condition of the nomenclature and the inferior position occupied by the groups in most manuals of zoölogy, so far as treatment is concerned. We may hope that the laboratories of Prof. Alexander Agassiz and of the Johns Hopkins University, with the other seaside summer schools, may produce good fruit in this direction. There is certainly no department as a whole in which more work must be done of all (except merely descriptive) kinds, before the science can be put on a satisfactory footing.

Even under the present adverse circumstances, a creditable amount of good work has been done in several directions, and we may reasonably expect that succeeding years will be hardly less fruitful. The harvest truly is plenteous but the laborers are few.

General Works on Mollusca.—But one publication which can claim to be of this nature has appeared in America in 1879. This is a "Manual of Conchology, structural and systematic, with illustrations of the species," by Geo. W. Tryon, Jr.; 8vo, Philadelphia, the author, 1879, *et seq.* Of this, three parts of Vol. 1, *Cephalopoda*, have come to hand, and include 192 pages of text and seventy plates. The scope of the work is thus stated by the author: It is to be a "Conchological manual, which, while more comprehensive than any similar work hitherto published, shall be so condensed in text and illustration, that it may be issued at a much more moderate price. It will include, in systematic order, the diagnoses of all the genera and higher divisions of the Mollusca, both recent and fossil, and the descriptions and figures of all the recent species, together with the main features of their anatomy and physiology, their embryology and development, their relation to man and other animals, and their geological and geographical distribution." "Each part will be complete in itself, Part I will contain the Cephalopoda; the Muricidæ will follow." "Only 250 copies will be published." It is but fair to say that the parts of this gigantic undertaking, which have so far appeared, comprise the results of a surprising amount of industry.

Anatomy and Development.—Perhaps the most important papers which have appeared in this department during the year, are those of Prof. W. K. Brooks in the "Scientific Results of the Session of 1878, Chesapeake Zoölogical Laboratory;" 8vo, 170 pages, 13 plates, Baltimore, Johns Hopkins University, 1879.

Of the two papers referred to, the first on "The Development of *Lingula* and the systematic position of the Brachiopoda," is the most extended (35–112 pp., 6 pl.) and important. The first portion is devoted to a description of the features of the embryos of *Lingula* (*Glottidia*) *pyramidata* Stm., with a review of previous investigations on the same subject. The second part reviews the "Bearing of the development of *Lingula* upon the systematic position of the Brachiopoda." The several very diverse views of different authors are discussed in the light of the new facts previously set forth, and especially that theory held and expounded with so much energy and wit by Prof. E. S. Morse, that the Brachiopods were (1) Annelids or (2) "Vermes."

The important contributions to our knowledge of the early stages of Brachiopods, made by Prof. Morse in the past, entitle any views of his to respectful consideration, such as is here accorded to them, but with the result of dismissing the first (which indeed had never been accepted in literal fashion by any naturalist of standing except Prof. Morse) very briefly, and for the second, concluding that "the Brachiopods then are 'Vermes' in the same sense that the Echinoderms, Mollusca, Tunicates and Vertebrates are" (l. c. p. 102), and reiterating views expressed in 1876, to the effect that, "as soon as we recognize that the Lamellibranchs are not to be regarded as typical Mollusca, and that all of the latter are to be traced back to a 'Veliger,' all difficulty seems to disappear, and it becomes plain, not only that Mollusca and Molluscoida are related, but that they are connected so closely that the advisability of such a division is very doubtful."

Ten years ago many crudities, due to the defective state of our knowledge of the development of the Invertebrata, obscured the relations of many forms now more or less thoroughly understood. At that time the present writer took strong ground in favor of a position essentially similar to that which more lately has received the support of Prof. Huxley, and which the labors of Brooks have more thoroughly elucidated and now placed on a firm basis. As this position was vehemently contested at that time by Prof. Morse, and was considered by other good naturalists as somewhat unsafe, it is with more than ordinary pleasure that the writer now records the latest step of progress which, while it has corrected many of his own misconceptions, has resulted in proving the essential correctness of the main features of his hypothesis of that earlier time.

It is hardly necessary to add that the Tunicata, then left by both Morse and himself, as well as the great body of naturalists, in the company of the Molluscoida, have since been effectually divorced from them, and may be said to have hardly found even yet, with relation to other invertebrates, a definite location.

The second paper of Prof. Brooks on "Preliminary observations upon the development of the marine prosobranchiate Gasteropods," concerns the early stages of *Astyris* and *Urosalpinx*, and comprises an abstract of observations, with one plate.

Still another report on important biological work in this department, is Prof. Brook's "Abstract of observations upon the artificial fertilization of oyster eggs and on the embryology of the American oyster." *Am. Journ. Sci.*, XVIII, No. 108, December, 1879, pp. 425–427.

Important differences of breeding habits are pointed out between the *O. virginica* of America and the *O. edulis* of Europe. The eggs of the American oyster are fertilized outside the body of the parent, and the young swim at large during the period in which the fry of the European species are sheltered in the mantle cavity of the parent. At the breeding season each individual adult contains only eggs or spermatozoa. Segmentation is completed in about two hours, and follows substantially the course described for other Lamellibranchs by Lovén and Fleming.

The oldest ones which could be raised were almost exactly like the embryos of *Cardium* as figured by Lovén. The oysters seemed fertile at hardly more than one year of age, and from ripe individuals millions of ova were artificially successfully fertilized.

A short paper on the anterior pair of muscles of the oyster, usually overlooked in descriptions of the genus, was presented to the Philosophical Society of Washington, by W. H. Dall, and their probable homology with the pedal muscles of Dimyarians suggested.

In the Journal of the Cincinnati Society of Natural History, July, 1879, Prof. A. G. Wetherby gives some notes in regard to the anatomy of *Bulimnæa megasoma* Hald., especially in regard to the form and appearance of the soft parts, the digestive tract and the reproductive organs, which latter are illustrated by cuts.

In a paper read at a late meeting of the Boston Society of Natural History, by Prof. R. P. Whitfield, some singular changes in the soft parts of the above-mentioned species are described as produced during confinement in an aquarium of successive generations, the progeny of a single individual. An abstract of this paper has appeared in the NATURALIST (Vol. XIV, No. 1, p. 5–12). The individuals of successive generations diminished in size and the male organs disappeared. This, which has been ascribed by Hyatt to a change in temperature (l. c. p. 52), is perhaps more probably due to a deficient food-supply (this species, according to Wetherby, is partially carnivorous) and the action of the physiological law to which Meehan has frequently called attention, of the greater persistence in cases of pauperization, of female or mother-functions and members.

"On the jaw and lingual dentition of certain terrestrial Mollusks, by W. S. Binney, Bull. Mus. Comp. Zoöl., v, No. 16. 8vo, pp. 332, 2 pl. Cambridge University press, Dec., 1879.

This important though brief paper comprises anatomical notes, chiefly in regard to the radula, of *Onchidella* (*Onchidium* ?) *carpenteri* Binney; *Zonites whitneyi* Newc.; *Z. subplanus* Binn.; *Janulus stephanophora* Desh.; *J. bifrons* Lowe; *Urocyclus kirkii* Gray (?); *Cionella gloynei* Gibbons; *Hemitrochus milleri* Pfr.; *Plagioptycha duclosiana* Fér.; *Microphysa stearnsii* Bl.; *Triodopsis vultuosa* Gld.; *Mesodon sayii* Binn. var. *Chilhoweensis*; *M. devia* Gld.; *Pomatia humboldtiana* Val.; *Ochthephila tiarella* W. and B.; *O. abjecta* Lowe; *Plebecula lurida* Lowe; *Leptaxis undata* Lowe; *Veronicella* (sp. indet.) and *V. olivacea* Stearns; *Hemphillia glandu-*

losa Binn. and Bl.; *Simpulopsis corrugatus* Guppy; *Bulimulus schiedeanus* Pfr.; *B. immaculatus* Ad.; *Macroceramus inermis* Gundl.; *Cylindrella Chemnitziana* Fér.; *Omalonyx felina* Guppy (united by Binney and Bland to *O. unguis*); *Arionta intercisa* Binn.; and *Vitrina latissima* Lewis, which is erected into a new genus (p. 333) under the name of *Vitrinizonites.* It is related to *Vitrina* and *Zonites*, but differs by satisfactory characters. For a new species of slug from Natal, Africa, the (preoccupied) name of *Chlamydephorus* (rightly *Chlamydophorus*) is proposed, the species taking the name of *Gibbonsii* after its discover. *Pupa cincinnatiensis* Judge, is said to be a synonym of *P. contracta* Say, and *Tectula lincta* Lowe, from Madeira, is said to be viviparous.

These notes are followed by systematic references to the notes on various species of Mollusks in regard to which Mr. Binney has published anatomical observations or figures; by a complete bibliographical list of Mr. Binney's numerous contributions to science; and by a useful list of the known genera of slugs with their generic characters as far as they could be ascertained.

Mr. Binney has also contributed to the Annals of the New York Academy of Sciences, I, No. 9, pp. 257–262, with Pl. XI (May 9, 1879), a paper on the jaw and lingual dentition of certain Costa Rican land shells collected by the late Dr. Wm. M. Gabb. He describes anatomical features of *Limax semitectus?* Mœrch, *Bulimulus irazuensis* Angas, and of undetermined species of *Glandina*,' *Helix* and *Tebennophorus*, together with two new genera and species, *Velifera gabbi* (allied to *Helicarion*) and *Crypto strakon* (mel. *Cryptostracum*) *gabbi*, a curious slug with a concealed rudimentary shell and teeth resembling those of *Polygyra*, etc.

The first essay toward a really scientific study of our American Nudibranchiata, is contained in a paper contributed by Dr. R. Bergh, of Copenhagen, to the Proceeedings of the Philadelphia Academy of Natural Sciences for 1879, pp. 71–132, "On the nudibranchiate gasteropod Mollusca of the North Pacific ocean, with special reference to those of Alaska," Part I, pl. I–VIII. This paper is almost wholly anatomical, and by the acknowledged highest living authority on the subject. Twenty-seven species are considered, of which two-thirds are new and most of the others are for the first time adequately characterized. The distribution of the North Pacific species is discussed, and the genera subjected to analysis, while their exotic species are usually enumerated. Most of the forms are from Alaska, but several of the more elegant species are Californian, while a special interest attaches to the rediscovery at Unalashka, and identification by Dr. Bergh, of the singular and anciently described *Tritonia tetraquetra* of Pallas. A number of Cooper's ill-defined Californian species are now placed on a solid basis, and several new generic forms are characterized. The paper does not admit of a proper representation by an abstract, and the reader is referred for further information to the original. It will be followed by a second part containing eight additional plates, and is based, for the most part, on the collections of Mr. W. H. Dall in Alaska and California from 1865 to 1874.

Another paper, in part anatomical, based on the same collections, is that of Mr. W. H. Dall in the Proceedings of the U. S. National Museum, a "Report on the Limpets and Chitons of the Alaskan and Arctic regions, with descriptions of genera and species believed to be new" (l. c. pp. 281–344, Pl. I–V, Feb. 13, 1879). This paper contains a summary intended to exhibit all that is known in regard to the anatomy and development of the *Chitonidæ*, including the results of the author's investigations and a synopsis (with some additions and rectifications) of Carpenter's classification of the group, in which a large number of genera are for the first time characterized; and others, defined by Dr. Carpenter (in his table of the regular Chitons, 1873), are more fully alluded to. The plates represent dissections of the radula of forty-five species belonging to thirty-three genera, whereas not more than a dozen species had previously been figured, and of these only a few (by Sars and Lovén) in an intelligible manner. The author's observations so far as they extend agree in the main with those of Von Ihering, which were made about the same time at Trieste. The renal pore described by Ihering, but not found by Dall, appears from information received from the former, to have been due to a misconception. As the limpets had been already treated rather fully by the author, the list here given is merely a synopsis, with additions and corrections, of his previous work. The work so far as the region it covers has a somewhat monographic character, and it is hoped will serve as a preliminary to the elaborate monograph of Dr. Carpenter, which is in process of preparation under the direction of the Smithsonian Institution.

As a whole, the paper is too extended to admit of a thorough abstract. A few new Alaskan species are described in it.

In the Transaction of the Connecticut Academy, v., p. 177 *et seq.*, Prof. Verrill begins an exhaustive paper, largely anatomical, on the Cephalopods of the North-eastern coast of North America; Part I.—The gigantic squids (*Architeuthis*) and their allies, etc. The first two signatures of this paper bear date of December, 1879, and it is proper to call attention to it, though as a whole the paper will not make its appearance until some time in the present year, and therefore will more appropriately be discussed in a review of publications of 1880.

Descriptive, taxonomic and faunal papers.—While most of the papers enumerated under the preceding head, would, in part, be appropriately cited here, those about to be mentioned are such as could not properly be classed under the former caption.

Prominent among descriptive papers of each year for a long time, have been those of Verrill, based for the most part on material gathered by the U. S. Fish Commission and its collaborators. During 1879, however, the mollusca have been fewer than usual, and it begins to seem as if the molluscan fauna of the North-eastern American coast were pretty thoroughly described and enumerated so far as determination of the species is concerned. Still occasional novelties turn up, mostly deep-water or northern forms, and from time to time others may be expected. This year the American Journal of Science contains three papers by Prof. Verrill in which mollusca are described or enumerated.

In "Notice of recent additions to the Marine fauna of the eastern coast of North America, No. 3." l. c. XVII, March, 1879, p. 241–3, *Histioteuthis collinsii* Verrill is described and another cephalopod identified doubtfully as *Taonius hyperboreus* Stp. In the same, No. 4, April, 1879, pp. 311–15, *Acanthodoris ornata* and *citrina*, *Coryphella rutila* and *Cuthona stimpsoni* are described as new, while a number of notes are given relating to previously described species of gasteropods. In the same, No. 7, December, 1879, pp. 468–70, two new species and one new genus of cephalopods are described, namely, *Stauroteuthis syrtensis* Verrill, n. g. et sp. and *Octopus piscatorum* Verrill, sp. n. The former is stated to be somewhat distantly allied to *Cirroteuthis*.

Prof. Verrill also contributes a paper to the Proc. U. S. National Museum for November, 1879, pp. 165–205, under the title of

"Notice of recent additions to the marine invertebrata of the North-eastern coast of America," etc. Besides descriptions of many Polyzoa and a new Ascidian the author notes as new to the eastern coast, *Xylophaga dorsalis* Turton, *Lunatia nana* Möller (also found by Möller in Greenland, and by Dall in Alaska) and *Idalia pulchella* Alder and Hancock. *Dendronotus robustus* Verrill, is stated to be identical with and prior to *D. velifer* Sars, from Norway.

In the Proceedings of the Academy of Natural Sciences of Philadelphia for 1879, p. 16, Mr. W. G. Binney mentions *Arionta rowellii* and *A. facta* Newc., with *Binneya notabilis* Cp., as found on the Mexican island of Guadalupe off the coast of Lower California. He suggests that the Mexican genus *Xanthonyx* is probably synonymous with *Binneya.* In the same periodical Mr. Andrew Garrett gives a list of land shells inhabiting Rurutu, one of the Austral (Pacific) Islands with remarks on their synonymy, geographical range and descriptions of new species; l. c. pp. 17–30. It contains twenty-three species, of which eight are new. On page 31 of the Proceedings Mr. Garrett describes *Goniobranchus albopunctatus,* sp. n., from Huahine, Society islands.

In the *Canadian Naturalist,* VIII, n. s. No. 8, Mr. J. F. Whiteaves publishes a short paper of nine pages, "On some marine invertebrata from the west coast of North America," which contains among other things a very interesting list of mollusks from the coast of British Columbia, one of which, *Cardium richardsonii* is described as new. This paper (though stated to be published Dec. 20, 1878), is of such interest to the students of geographical distribution that I include a notice of it here. It partially fills a gap which has long existed in our knowledge of the invertebrata of the fauna existing between Puget sound and Alaska. This fauna for the most part is Oregonian in character and contains few locally characteristic mollusks.

In the report of the Chesapeake Zoölogical Laboratory (Johns Hopkins University), which contains the papers of Prof. W. K. Brooks, before mentioned, is a list by Mr. P. R. Uhler, of animals found at Fort Wool, in the Lower Chesapeake. This contains thirty-one species of mollusks, all of which had been previously known, though several were new to the region. It must be stated that the identification of one of these, as *Chiton cinereus* Lin., is doubtless an oversight; as that is a northern species, Arctic and

European in its distribution, and not known from any part of America.

In Prof. Wetherby's Notes on Limnæidæ, previously mentioned, he claims to have for the first time correctly identified *Planorbis glabratus* Say, since it was originally described, and characterizes as new *P.* (*Helisoma*) *duryi*, both coming from Florida.

In *Science News* for April 15, 1879, Mr. Arthur F. Gray notes the comparatively recent spread of *Litorina litorea* L., which, first described as American from Nova Scotia specimens, doubtless was brought over on ballast, and has reached as far south as Stonington, Connecticut. The writer can positively state that twenty years ago it was not found on the shores from Beverly to Boston, though now rather common there, and such records of its migration as the above are interesting and valuable.

In the Proceedings of the American Philosophical Society (Sept. 1879) pp. 282–288, Dr. J. G. Cooper publishes "Notes on some land-shells of the Pacific slope." This is chiefly a criticism of some of Mr. Binney's work. Dr. Cooper thinks that the little Alaskan *Patula* is not *pauper* of Gould, but a comparison with Gould's types would have led him rather to sustain the identification of Binney and Bland, as the specimens are precisely similar and from a similar faunal region.

The shells of the Colorado desert are the subject of an article by R. E. C. Stearns in the March number of the AMERICAN NATURALIST. Although fossilized shells, the paper has a right to mention here, from the fact that it is a matter of doubt whether all these species are fully extinct even in America, while Dybowski has described large numbers of *Tryonicæ* (under other names) from Lake Baikal, one species of which is hardly distinguishable from *T. clathrata* Stm., figured by Stearns.

Mr. W. W. Calkins, who has repeatedly visited Florida on scientific tours, published a paper on the "Marine Shells of Florida," in the Proceedings of the Davenport Academy of Sciences in 1878, comprising a catalogue, descriptions of supposed new species and some remarks on the distribution of species included in his list.

This paper was noticed in *Science News* of February 15, 1879, and in the number for April 15th, Mr. R. E. C. Stearns points out some errors of identification which occur in Mr. Calkins' paper, whereby West American and Floridian species were included under one name.

In Bulletin No. 14 of the U. S. National Museum, we have a "Catalogue of the Collection illustrating the animal resources and the fisheries of the United States," prepared under the direction of Mr. G. Brown Goode, and referring to the collection exhibited by the National Museum and the Smithsonian Institution at Philadelphia in 1876.

Part II, of this Bulletin (pp. 249–271) comprises the "Catalogue of illustrations of the Economical Invertebrates of the American coasts, by W. H. Dall." Nine pages (251-259) of this relates to Mollusks, in which, of course, the pearl shells and oysters occupy the larger part. Had the uses of exotic Mollusks also been considered, the list might have been considerably augmented; the number of species given among the Gasteropods and Lamellibranchs includes few except those actually used for food or bait. A very much larger number might have been enumerated as possibly available, but this was not thought desirable.

A very useful aid to all students of the fauna of the North-east American coast, is the "Preliminary Check-list of the marine Invertebrata of the Atlantic coast from Cape Cod to the Gulf of St. Lawrence, by A. E. Verrill," prepared for the U. S. Fish Commission, of which the author's edition was printed at New Haven in June, 1879. Four hundred and seventy-four species and varieties of Mollusks and Molluscoids are enumerated, and forty-three Tunicates, distributed as follows: Cephalopods, 12 sp.; Gasteropods (including 44 sp. Nudibranchiates), 187 sp.; Pteropods, 4 sp.; Solenoconchs, 3 sp.; Lamellibranchs, 122 sp.; Brachiopods, 3 sp. (and two doubtful ones); Polyzoa, 141 sp.; and Tunicates, 43 sp. and varieties. A comparison of these numbers with those of Stimpson's Smithsonian Check-list of 1860, "Arctic seas to Georgia," including practically all that was then known of the Atlantic coast, shows the vast progress that has been made. Stimpson's numbers are as follows: Cephalopods, 16 sp; Gasteropods (including 22 Nudibranchs), 240 sp.; Pteropods, 6 sp.; Solenoconchs, 2 sp.; Lamellibranchs, 189 sp.; Brachiopods 3 sp. (2 doubtful); Polyzoa, 27 sp.; and Tunicates 29 sp.; total for the whole Atlantic coast, 514 species and varieties, against 517 now catalogued for the small portion between the Gulf of St. Lawrence and Cape Cod alone.

This great advance may be almost wholly attributed to the researches of the officers of the U. S. Fish Commission and those associated with them, and especially to the untiring activity of the author of this check-list.

In his "Zoölogy for Students and general Readers," by A. S. Packard, Jr., the nervous system and pedal ganglia and otocysts of *Mya arenaria* are figured from drawings prepared by Dr. W. K. Brooks. Prof. Packard also gives a general account of the anatomy of *Lunatia heros*, and of *Loligo pealii.*

A new form of *Helix* from California, apparently related to *H. mormonum*, is described by Mr. R. E. C. Stearns in the Annals of the New York Academy of Sciences, I, No. 10, Nov., 1879, article XXVI, with a figure, under the name of *H.* var. *circumcarinata* Stearns.

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RECENT LITERATURE.

SMITH'S BRAZIL; THE AMAZONS AND THE COAST.[1]—Of the many delightful books which have been written on Brazil, this is, to our taste, the most interesting. Its author was, for a time, a member of the Geological Survey of Brazil under Prof. Hartt, and brings to the task of writing a popular book, many qualifications. His work displays scientific knowledge, acute powers of observation, an insight into the social and business interests of the inhabitants, and an enthusiastic love of nature. His style is vivacious, and we are carried with ready facility from forests to fevers, from plains to insects, from politics to navigation, while a narrative of travel appears here and there as we pass from one scene to another. The variety of subjects treated will interest a large circle of readers. As Mr. Smith is an accomplished entomologist, his contributions to this department have an especial value. The statements of the results of a day's collecting of beetles are remarkable. On December 17th he took 394 specimens of 275 species in about eight hours. On January 29th, 471 specimens of 268 species. The famine of Ceara, 1877–78, of which Mr. Smith was an eye-witness, is graphically described. The industrial statistics will interest American merchant especially. The execution of the work, including the numerous wood engravings, is admirable.

NATURAL SCIENCE AND RELIGION.[2]—In these lectures Dr. Gray furnishes the theological students of Yale with his reasons for maintaining a belief in the evolution of animal and vegetable spe-

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[1] *Brazil; The Amazons and the Coast.* By Herbert H. Smith. Illustrated by sketches by Champney, etc. New York, Chas. Scribner's Sons, 1879. 8vo, pp. 644.

[2] Two lectures delivered to the Theological School of Yale College. Chas. Scribner's Sons. 8vo, 1880.